

WHAT IS CLAIMED IS:

1. A phase-changeable device comprising:
 - a first insulating layer disposed on a first electrode;
 - 5 a heater plug extending through the first insulating layer and contacting the first electrode;
 - a buffer insulating layer region disposed on the first insulating layer opposite the first electrode;
 - a phase-changeable material region disposed on the buffer insulating layer
 - 10 region, wherein the phase-changeable material region extends into the buffer insulating layer region so as to contact a surface of the heater plug; and
 - a second electrode disposed on the phase-changeable material region.
2. The phase-changeable device of Claim 1, wherein the phase-
 - 15 changeable device comprises a memory device and wherein the first electrode is electrically connected to an impurity diffusion layer of a substrate with an insulating layer interposed there between.
3. The phase-changeable device of Claim 1, wherein a thermal expansion
 - 20 coefficient of the buffer insulating layer region is between a thermal expansion coefficient of the first insulating layer and a thermal expansion coefficient of the phase-changeable material region.
4. The phase-changeable device of Claim 3, wherein the first insulating
 - 25 layer comprises a silicon oxide layer, the buffer insulating layer region comprises a silicon nitride layer and the phase-changeable material region comprises a gallium, stibium and tellurium (GST) region.
5. The phase-changeable device of Claim 1, wherein the buffer insulating
 - 30 layer region extends from an edge toward a center of the heater plug so as to cover a portion of a surface of the heater plug.
6. The phase-changeable device of Claim 5, wherein a thermal expansion coefficient of the buffer insulating layer region is between a thermal expansion

coefficient of the first insulating layer and a thermal expansion coefficient of the phase-changeable material region.

7. The phase-changeable device of Claim 6, wherein the first insulating
5 layer comprises a silicon oxide layer, the buffer insulating layer region comprises a silicon nitride region and the phase-changeable material region includes a gallium, stibium and tellurium (GST) region.

8. The phase-changeable device of Claim 1, further comprising sidewall
10 spacers between sidewalls of an opening in the buffer insulating layer region and a portion of the phase-changeable material region.

9. The phase-changeable device of Claim 8, wherein a thermal expansion
coefficient of the buffer insulating layer region is between a thermal expansion
15 coefficient of the first insulating layer and a thermal expansion coefficient of the phase-changeable material region.

10. The phase-changeable device of Claim 9, wherein the first insulating
layer comprises a silicon oxide layer, the buffer insulating layer region and the spacers
20 comprise silicon nitride regions and the phase-changeable material region includes a gallium, stibium and tellurium (GST) region.

11. The phase-changeable device of Claim 5, further comprising sidewall
spacers between sidewalls of an opening of the buffer insulating layer region and a
25 portion of the phase-changeable material region.

12. The phase-changeable device of Claim 2 further comprising:
a second insulating layer disposed on the buffer insulating layer region so as to
cover the second electrode and the phase-changeable material region;
30 a contact plug connecting the second electrode through the second insulating layer; and
a metal interconnection disposed on the contact plug and second insulating layer.

13. A phase-changeable device comprising:
a first insulating layer disposed on a first electrode;
a buffer insulating layer region disposed on the first insulating layer;
a heater plug that extends into the buffer insulating layer region and through
5 the first insulating layer, and contacts the first electrode;
a phase-changeable material region disposed on the buffer insulating layer
region and the heater plug; and
a second electrode disposed on the phase-changeable material region.
- 10 14. The phase-changeable device of Claim 13, wherein the phase-
changeable device comprises a memory device and wherein the first electrode is
electrically connected to an impurity diffusion layer of a substrate with an insulating
layer interposed therebetween.
- 15 15. The phase-changeable device of Claim 13, wherein a thermal
expansion coefficient of the buffer insulating layer region is between a thermal
expansion coefficient of the first insulating layer and a thermal expansion coefficient
of the phase-changeable material region.
- 20 16. The phase-changeable device of Claim 13, wherein the first insulating
layer comprises a silicon oxide layer, the buffer insulating layer region comprises a
silicon nitride region and the phase-changeable material region comprises a GST
region.
- 25 17. The phase-changeable device of Claim 14 further comprising:
a second insulating layer disposed on the buffer insulating layer region so as to
cover the second electrode and the phase-changeable material region;
a contact plug connected to the second electrode through the second
insulating layer; and
30 a metal interconnection disposed on the contact plug and the second
insulating layer.

18. A method of fabricating a phase-changeable device comprising:
forming a first insulating layer on a first electrode;
forming a heater plug extending through the first insulating layer and
contacting the first electrode;
5 forming a buffer insulating layer region on the first insulating layer opposite
the first electrode;
forming a phase-changeable material region on the buffer insulating layer
region, wherein the phase-changeable material region extends into the buffer
insulating layer region so as to contact a surface of the heater plug; and
10 forming a second electrode on the phase-changeable material region.
19. The method of Claim 18, wherein the phase-changeable device
comprises a memory device, the method further comprising forming the first
electrode so as to electrically connect to an impurity diffusion layer of a substrate with
15 an insulating layer interposed there between.
20. The method of claim 18, wherein the forming a buffer insulating layer
region comprises:
forming a buffer insulating layer on the heater plug and the first insulating
20 layer;
forming a photoresist pattern on the buffer insulating layer;
etching the exposed buffer insulating layer using the photoresist pattern as an
etching mask so as to provide the buffer insulating layer region.
21. The method of Claim 20, further comprising forming spacers on
25 sidewalls of the buffer insulating layer region adjacent the heater plug.
22. The method of Claim 21, wherein the first insulating layer is formed of
silicon oxide, the buffer insulating layer region and the spacers are formed of silicon
30 nitride and the phase-changeable material layer is formed of gallium, stibium and
tellurium (GST).
23. The method of Claim 20, wherein a diameter of an opening defined by
the photoresist pattern is less than a diameter of the heater plug, and wherein the

buffer insulating layer region extends from an edge toward a center of the heater plug so as to expose a central portion of a surface of the heater plug.

24. The method of Claim 23, further comprising forming spacers on
5 sidewalls of the buffer insulating layer region adjacent the heater plug.

25. The method of Claim 24, wherein the forming the spacers comprises:
forming a spacer insulating layer on the buffer insulating layer region and a
portion of the heater plug exposed by the buffer insulating layer region; and
10 etching back the spacer insulating layer.

26. The method of Claim 23, wherein the first insulating layer is formed of
silicon oxide, the buffer insulating layer region and the spacers are formed of silicon
nitride and the phase-changeable material layer is formed of gallium, stibium and
15 tellurium (GST).

27. The method of Claim 19 further comprising:
forming a second insulating layer on the buffer insulating layer region so as to
cover the second electrode and the phase changeable material region;
20 forming a contact plug contacting the second electrode through the second
insulating layer; and
forming a metal interconnection on the second insulating layer wherein the
metal interconnection is electrically connected to the contact plug.

25 28. A method of fabricating a phase-changeable device, comprising:
forming a first insulating layer on a first electrode;
forming a buffer insulating layer region on the first insulating layer;
forming a heater plug that extends into the buffer insulating layer region and
through the first insulating layer, and contacts the first electrode;
30 forming a phase-changeable material region disposed on the buffer insulating
layer region and the heater plug; and
forming a second electrode disposed on the phase-changeable material region.

29. The method of Claim 28, wherein the phase-changeable device

comprises a memory device, the method further comprising forming the first electrode to electrically connect to an impurity diffusion layer of a substrate with an insulating layer interposed therebetween.

- 5 30. The method of claim 28, wherein the first insulating layer is formed of silicon oxide, the buffer insulating layer region is formed of silicon nitride and the phase-changeable material layer is formed of gallium, stibium and tellurium (GST).

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